

- (ii) expressing said DNA molecule in a suitable host cell, or expression system, together with a DNA molecule that encodes a corresponding antibody molecule light chain having the same specificity as the heavy chain, to produce an intact first antibody molecule containing said introduced cysteine residue;
- (iii) purifying said first intact antibody molecule from said host cell or expression system;
- (iv) contacting said purified first intact antibody molecule with an amount of a suitable reducing agent sufficient to partially reduce the intra or inter molecular disulfide bonds of said antibody molecule and said introduced cysteine residue and thereby enhance the formation of antibody dimers when said reduced intact antibody molecular is contacted with a second intact antibody molecular; and
- (v) contacting the purified first intact antibody molecule with a second intact antibody molecule having antigen specificity different than the antigen specificity of the first antibody molecule purified in step (iii) and which second intact antibody contains a thiol reactive group and which does not have a cysteine group introduced therein; and allowing sufficient time for the dimerization reaction to proceed; thereby producing an antibody heterodimer comprised of two intact antibody molecules each retaining their respective antigen binding specificity after dimerization.

24. (Twice Amended) A method for producing an antibody heterodimer comprised of two different intact antibody molecules respectively having binding specificity to two distinct antigens, wherein the method comprises:

- (i) obtaining or constructing a DNA molecule that encodes an antibody molecule heavy chain that has binding specificity to a first antigen when paired with a complementary antibody light chain and introducing at least one cysteine codon therein via recombinant DNA mutagenesis, wherein the location of said introduced cysteine does not interfere with the antigen binding properties of said heterodimer;
- (ii) expressing said DNA molecule in a suitable host cell, or expression system, together with a DNA molecule that encodes said complementary antibody molecule

(iii) purifying said intact antibody molecule from said host cell or expression system;

(iv) contacting said purified antibody molecule with an amount of a suitable reducing agent sufficient to partially reduce the intra or inter molecular disulfide bonds of said antibody molecule and said introduce cysteine residue to thereby enhance the formation of antibody dimers; and

(v) adding a thiol reactive group onto a second intact antibody molecule having antigen specificity different than the antigen specificity of the intact antibody molecule purified in step (iii) and which does not have a cysteine group introduced therein and allowing sufficient time for the dimerization reaction to proceed; thereby producing said antibody heterodimer comprised of two intact antibody molecules each retaining their respective different antigen binding specificity after dimerization.

28. (Twice Amended) An IgG/IgG dimer produced by the method of Claim 45, wherein said IgG's are of the same or different IgG subclass.

41. (Twice Amended) A pharmaceutical composition comprising an IgG/IgG dimer according to Claim 45, and a pharmaceutically acceptable carrier.

45. (Twice Amended) A method for producing an IgG/IgG heterodimer comprised of two intact IgG's binding a different antigen, said IgG/IgG heterodimer produced by a method comprising genetically engineering a first IgG MAb having specificity to a first antigen to introduce a cysteine molecule at a position which does not interfere with the antigen binding properties of said antibody heterodimer containing said IgG Mab and further inhibits or prevents formation of an intramolecular disulfide bridge between sister heavy chains on the same antibody molecule, reducing said introduced cysteine residue, and exposing said first intact Mab to a second intact IgG Mab having specificity to a different antigen then said first intact Mab and which comprises a thiol reactive group to produce said IgG/IgG dimer comprised of two intact IgG molecules which respectively retain their different antigen binding specificity after dimerization.